

## WHAT IS CLAIMED:

1. A sheet feeding device, comprising:
  - a cassette configured to accommodate recording media; and
  - a recording media feeding member configured to feed out the recording media accommodated in the cassette,wherein the cassette comprises:
  - a tray main body part including a stacking plate configured to have the recording media stacked thereon; and
  - a recording media conveying guide part configured to be detachably connected to the tray main body part, the recording media conveying guide part comprising,
    - a raising member configured to raise the stacking plate toward the recording media feeding member; and
    - a raising and lowering member connected to the raising member and configured to raise and lower the stacking plate.
2. The sheet feeding device according to claim 1, wherein the raising and lowering member is configured to raise the stacking plate to a predetermined position when the cassette is installed in the sheet feeding device.
3. The sheet feeding device according to claim 1,
  - wherein the stacking plate is configured to swing up and down according to a quantity of the recording media stacked on the stacking plate,
  - wherein the sheet feeding device further comprises:
    - a recording media end detection member disposed at a position adjacent to a swinging side end of the stacking plate and configured to contact the recording media stacked on the stacking plate and configured to be moved in a direction of a thickness of the recording media stacked on the stacking plate; and
    - at least one pass-through part formed at the swinging side end of the stacking plate and configured to oppose the recording media end detection member via the recording media stacked on the stacking plate, and
    - wherein the recording media and detection member is configured such that an end condition of the recording media in which all the recording media stacked on the

stacking plate are fed out from the cassette is detected when the recording media end detection member falls into the at least one pass-through part.

4. The sheet feeding device according to claim 3,

wherein the recording media feeding member is configured to be disposed at a position corresponding to a center position of the recording media in a widthwise direction of the recording media corresponding to a direction orthogonal to a feeding direction of the recording media stacked on the stacking plate, and

wherein the at least one pass-through part comprises two pass-through parts, and the two pass-through parts are configured to be formed at positions of the swinging side end of the stacking plate corresponding to both side positions relative to the recording media feeding member in the widthwise direction of the recording media stacked on the stacking plate.

5. The sheet feeding device according to claim 1,

wherein the stacking plate is configured to swing up and down according to a quantity of the recording media stacked on the stacking plate,

wherein the sheet feeding device further comprises:

a remaining quantity detection device configured to shift in conjunction with swinging up and down operations of a swinging side end of the stacking plate; and

a detection device configured to output a signal according to a shift position of the remaining quantity detection device, and

wherein the detection device is configured to detect a remaining quantity of the recording media stacked on the stacking plate in a plurality of steps and to detect shift positions of the remaining quantity detection device stepwise.

6. The sheet feeding device according to claim 5,

wherein the remaining quantity detection device is configured to swing around a fulcrum, and has a swinging side end at a swinging end side of the stacking plate, and includes an actuator at a position of the fulcrum,

wherein the actuator is configured to interrupt a plurality of optical paths of the detection device, and

wherein the detection device is configured to detect a remaining quantity of the recording media stacked on the stacking plate and to detect an interruption of the plurality of optical paths by the actuator.

7. The sheet feeding device according to claim 5, further comprising:

a remaining quantity detection auxiliary member configured to be provided to a side face of the stacking plate in a widthwise direction of the recording media corresponding to a direction orthogonal to a feeding direction of the recording media stacked on the stacking plate, the side face of the stacking plate to which the remaining quantity detection auxiliary member is provided adjacent to the swinging side end of the stacking plate,

wherein the remaining quantity detection auxiliary member sandwiches the side face of the stacking plate, and is configured to swing together with the remaining quantity detection device as a position of the swinging side end of the stacking plate is configured to change according to a remaining quantity of the recording media stacked on the stacking plate, and is configured to regulate a swing amount of the stacking plate to prevent the stacking plate from swinging beyond a predetermined location.

8. The sheet feeding device according to claim 1, wherein the recording media conveying guide part comprises a positioning part, and the recording media conveying guide part engages with the tray main body part at the positioning part by elasticity of at least one of the recording media conveying guide part and the tray main body part.

9. The sheet feeding device according to claim 3, further comprising:

a remaining quantity detection device configured to shift in conjunction with swinging up and down operations of a swinging side end of the stacking plate; and

a detection device configured to output a signal according to a shift position of the remaining quantity detection device,

wherein the detection device is configured to detect a remaining quantity of the recording media stacked on the stacking plate in a plurality of steps and to detect shift positions of the remaining quantity detection device stepwise.

10. The sheet feeding device according to claim 9,

wherein the cassette further comprises:

a rear end regulation member configured to regulate rear ends of the recording media in a direction in which the recording media are fed;

a tray expansion/contraction part supported by the tray main body part and configured to slide to a cassette expanded position where the cassette is in an expanded state and to a cassette contracted position where the cassette is in a contracted state and including a part forming a moving path of the rear end regulation member so that the rear end regulation member is moved to regulate rear ends of the recording media; and

an auxiliary member that is configured to be attached, when the tray expansion/contraction part is in the cassette expanded position, to the part of the tray expansion/contraction part forming the moving path of the rear end regulation member to extend a length of the moving path of the rear end regulation member between the tray expansion/contraction part and the tray main body part and that is configured to be detached from the part of the tray expansion/contraction part forming the moving path of the rear end regulation member when the tray expansion/contraction part is in the cassette contracted position, and

wherein the device is configured such that when the length of the moving path of the rear end regulation member is changed, each positional relation of the recording media end detection member and the remaining quantity detection device relative to the stacking plate when no recording media are stacked on the stacking plate is unchanged.

11. The sheet feeding device according to claim 10,

wherein the part of the tray expansion/contraction part forming the moving path of the rear end regulation member comprises a rail configured such that the rear end regulation member is placed to slide thereon, and

wherein the auxiliary member comprises an auxiliary rail configured such that the rail is continued when the auxiliary rail is attached to the part of the tray expansion/contraction part forming the moving path of the rear end regulation member.

12. The sheet feeding device according to claim 11, wherein the auxiliary rail is configured, when the cassette is in the expanded state, to connect, at one side end of the auxiliary rail, with an end of the rail in the direction in which the recording media are fed and to contact the tray main body part at the other side end of the auxiliary rail.

13. The sheet feeding device according to claim 10, wherein the part of the tray expansion/contraction part forming the moving path of the rear end regulation member comprise a sliding guide part configured to support the rear end regulation member to slide,

and an end part of the sliding guide part at the side of the tray main body part is configured such that a fall-off prevention member attached to the end part of the sliding guide part can prevent the rear end regulation member from falling off the sliding guide part when the auxiliary member is not attached to the part of the tray expansion/contraction part forming the moving path of the rear end regulation member.

14. The sheet feeding device according to claim 13, wherein the end part of the sliding guide part of the part of the tray expansion/contraction part forming the moving path of the rear end regulation member is configured to engage with ends of the fall-off prevention member arranged across the sliding guide part.

15. The sheet feeding device according to claim 10, wherein the tray expansion/contraction part comprises a reinforcing member extended across the part of the tray expansion/contraction part forming the moving path of the rear end regulation member and integrated with the tray expansion/contraction part at both ends thereof in a direction in which the reinforcing member is extended and configured to prevent the tray expansion/contraction part from extending in a direction orthogonal to a direction in which the tray expansion/contraction part slides.

16. The sheet feeding device according to claim 10, wherein the tray main body part comprises holding parts configured to hold the tray expansion/contraction part at the cassette expanded position and the cassette contracted position, and an indication part configured to differentiate a state in which the tray expansion/contraction part is held by the tray main body part from a state in which the tray expansion/contraction part is released from being held by the tray main body part.

17. The sheet feeding device according to claim 16, wherein the tray expansion/contraction part comprises engaging members, and the holding parts of the tray main body part comprise locking parts configured to engage with and disengage from the engaging members of the tray expansion/contraction part, and the indication part is configured to differentiate a state in which the tray expansion/contraction part is held by the tray main body part from a state in which the tray expansion/contraction part is released from being held by the tray main body part according to engaging states of the engaging members of the tray expansion/contraction part and the locking parts of the tray main body part.

18. An image forming apparatus, comprising:  
an image forming device configured to form an image on an image carrier and to transfer the image to a recording medium; and  
a sheet feeding device configured to convey the recording medium to the image forming device, the sheet feeding device comprising:  
a cassette configured to accommodate recording media; and  
a recording media feeding member configured to feed out the recording media accommodated in the cassette, and  
wherein the cassette comprises,  
a tray main body part including a stacking plate configured to have the recording media stacked thereon; and  
a recording media conveying guide part configured to be detachably connected to the tray main body part, the recording media conveying guide part comprising:  
a raising member configured to raise the stacking plate toward the recording media feeding member; and  
a raising and lowering member connected to the raising member and configured to raise and lower the stacking plate.

19. The image forming apparatus according to claim 18, wherein the raising and lowering member is configured to raise the stacking plate to a predetermined position when the cassette is installed in the sheet feeding device.

20. The image forming apparatus according to claim 18,  
wherein the stacking plate is configured to swing up and down according to a quantity of the recording media stacked on the stacking plate,  
wherein the sheet feeding device further comprises:  
a recording media end detection member disposed at a position adjacent to a swinging side end of the stacking plate and configured to contact the recording media stacked on the stacking plate and configured to be moved in a direction of a thickness of the recording media stacked on the stacking plate; and  
at least one pass-through part formed at the swinging side end of the stacking plate and configured to oppose the recording media end detection member via the recording media stacked on the stacking plate, and

wherein the recording media end detection member is configured such that an end condition of the recording media in which all the recording media stacked on the stacking plate are fed out from the cassette is detected when the recording media end detection member falls into the at least one pass-through part.

21. The image forming apparatus according to claim 20,

wherein the recording media feeding member is configured to be disposed at a position corresponding to a center position of the recording media in a widthwise direction of the recording media corresponding to a direction orthogonal to a feeding direction of the recording media stacked on the stacking plate, and

wherein the at least one pass-through part comprises two pass-through parts, and the two pass-through parts are configured to be formed at positions of the swinging side end of the stacking plate corresponding to both side positions relative to the recording media feeding member in the widthwise direction of the recording media stacked on the stacking plate.

22. The image forming apparatus according to claim 18,

wherein the stacking plate is configured to swing up and down according to a quantity of the recording media stacked on the stacking plate,

wherein the sheet feeding device further comprises:

a remaining quantity detection device configured to shift in conjunction with swinging up and down operations of a swinging side end of the stacking plate; and

a detection device configured to output a signal according to a shift position of the remaining quantity detection device, and

wherein the detection device is configured to detect a remaining quantity of the recording media stacked on the stacking plate in a plurality of steps and to detect shift positions of the remaining quantity detection device stepwise.

23. The image forming apparatus according to claim 22,

wherein the remaining quantity detection device is configured to swing around a fulcrum, and has a swinging side end at a swinging end side of the stacking plate, and includes an actuator at a position of the fulcrum,

wherein the actuator is configured to interrupt a plurality of optical paths of the detection device, and

wherein the detection device is configured to detect a remaining quantity of the recording media stacked on the stacking plate and to detect an interruption of the plurality of optical paths by the actuator.

24. The image forming apparatus according to claim 22, further comprising:

a remaining quantity detection auxiliary member configured to be provided to a side face of the stacking plate in a widthwise direction of the recording media corresponding to a direction orthogonal to a feeding direction of the recording media stacked on the stacking plate, the side face of the stacking plate to which the remaining quantity detection auxiliary member is provided adjacent to the swinging side end of the stacking plate,

wherein the remaining quantity detection auxiliary member sandwiches the side face of the stacking plate, and is configured to swing together with the remaining quantity detection device as a position of the swinging side end of the stacking plate is configured to change according to a remaining quantity of the recording media stacked on the stacking plate, and is configured to regulate a swing amount of the stacking plate to prevent the stacking plate from swinging beyond a predetermined location.

25. The image forming apparatus according to claim 18, wherein the recording media conveying guide part comprises a positioning part, and the recording media conveying guide part engages with the tray main body part at the positioning part by elasticity of at least one of the recording media conveying guide part and the tray main body part.

26. The image forming apparatus according to claim 20, further comprising:

a remaining quantity detection device configured to shift in conjunction with swinging up and down operations of a swinging side end of the stacking plate; and

a detection device configured to output a signal according to a shift position of the remaining quantity detection device,

wherein the detection device is configured to detect a remaining quantity of the recording media stacked on the stacking plate in a plurality of steps and to detect shift positions of the remaining quantity detection device stepwise.

27. The image forming apparatus according to claim 26,

wherein the cassette further comprises:



a rear end regulation member configured to regulate rear ends of the recording media in a direction in which the recording media are fed;

a tray expansion/contraction part supported by the tray main body part and configured to slide to a cassette expanded position where the cassette is in an expanded state and to a cassette contracted position where the cassette is in a contracted state and including a part forming a moving path of the rear end regulation member so that the rear end regulation member is moved to regulate rear ends of the recording media; and

an auxiliary member that is configured to be attached, when the tray expansion/contraction part is in the cassette expanded position, to the part of the tray expansion/contraction part forming the moving path of the rear end regulation member to extend a length of the moving path of the rear end regulation member between the tray expansion/contraction part and the tray main body part and that is configured to be detached from the part of the tray expansion/contraction part forming the moving path of the rear end regulation member when the tray expansion/contraction part is in the cassette contracted position, and

wherein the apparatus is configured such that when the length of the moving path of the rear end regulation member is changed, each positional relation of the recording media end detection member and the remaining quantity detection device relative to the stacking plate when no recording media are stacked on the stacking plate is unchanged.

28. The image forming apparatus according to claim 27,

wherein the part of the tray expansion/contraction part forming the moving path of the rear end regulation member comprises a rail configured such that the rear end regulation member is placed to slide thereon, and

wherein the auxiliary member comprises an auxiliary rail configured such that the rail is continued when the auxiliary rail is attached to the part of the tray expansion/contraction part forming the moving path of the rear end regulation member.

29. The image forming apparatus according to claim 28, wherein the auxiliary rail is configured, when the cassette is in the expanded state, to connect, at one side end of the auxiliary rail, with an end of the rail in the direction in which the recording media are fed and to contact the tray main body part at the other side end of the auxiliary rail.

30. The image forming apparatus according to claim 27, wherein the part of the tray expansion/contraction part forming the moving path of the rear end regulation member comprises a sliding guide part configured to support the rear end regulation member to slide, and an end part of the sliding guide part at the side of the tray main body part is configured such that a fall-off prevention member attached to the end part of the sliding guide part prevents the rear end regulation member from falling off the sliding guide part when the auxiliary member is not attached to the part of the tray expansion/contraction part forming the moving path of the rear end regulation member.

31. The image forming apparatus according to claim 30, wherein the end part of the sliding guide part of the part of the tray expansion/contraction part forming the moving path of the rear end regulation member is configured to engage with ends of the fall-off prevention member arranged across the sliding guide part.

32. The image forming apparatus according to claim 27, wherein the tray expansion/contraction part comprises a reinforcing member extended across the part of the tray expansion/contraction part forming the moving path of the rear end regulation member and integrated with the tray expansion/contraction part at both ends thereof in a direction in which the reinforcing member is extended and configured to prevent the tray expansion/contraction part from extending in a direction orthogonal to a direction in which the tray expansion/contraction part slides.

33. The image forming apparatus according to claim 27, wherein the tray main body part comprises holding parts configured to hold the tray expansion/contraction part at the cassette expanded position and the cassette contracted position, and an indication part configured to differentiate a state in which the tray expansion/contraction part is held by the tray main body part from a state in which the tray expansion/contraction part is released from being held by the tray main body part.

34. The image forming apparatus according to claim 33, wherein the tray expansion/contraction part comprises engaging members, and the holding parts of the tray main body part comprise locking parts configured to engage with and disengage from the engaging members of the tray expansion/contraction part, and the indication part is configured to differentiate a state in which the tray expansion/contraction part is held by the

tray main body part from a state in which the tray expansion/contraction part is released from being held by the tray main body part according to engaging states of the engaging members of the tray expansion/contraction part and the locking parts of the tray main body part.

35. The image forming apparatus according to claim 18, wherein the sheet feeding device is disposed below the image forming device and is configured to receive a plurality of the cassettes.

36. A sheet feeding device, comprising:  
accommodating means for accommodating recording media; and  
recording media feeding means for feeding out the recording media accommodated in the accommodating means,

wherein the accommodating means comprises:

a tray main body part comprising a stacking plate configured to have the recording media stacked thereon; and

a recording media conveying guide part configured to connect detachably to the tray main body part, the recording media conveying guide part comprising:

raising means for raising the stacking plate toward the recording media feeding means; and

raising and lowering means for raising and lowering the stacking plate, the raising and lowering means connected to the raising means.

37. An image forming apparatus, comprising:  
image forming means for forming an image on an image carrier and for transferring the image to a recording medium; and

a sheet feeding device configured to convey the recording medium to the image forming means, the sheet feeding device comprising:

accommodating means for accommodating recording media; and

recording media feeding means for feeding out the recording media accommodated in the accommodating means,

wherein the accommodating means comprises:

a tray main body part comprising a stacking plate configured to have the recording media stacked thereon; and

a recording media conveying guide part configured to connect detachably to the tray main body part, the recording media conveying guide part comprising:

raising means for raising the stacking plate toward the recording media feeding means; and

raising and lowering means for raising and lowering the stacking plate, the raising and lowering means connected to the raising means.